TESTIMONY OF DAVID K. WHITCOMB APRIL 10, 1997
BEFORE THE HOUSE COMMITTEE ON COMMERCE, SUBCOMMITTEE ON FINANCE
in re H.R. 1053: "THE COMMON CENTS STOCK PRICING ACT OF 1997"

SUMMARY: I am Professor of Finance at Rutgers University, co-author of **The Microstructure of Securities Markets** and numerous other journal articles and monographs on market microstructure, and founder/CEO of Automated Trading Desk, Inc., which developed the first expert system for automated limit order trading. In 1996, ATD systems traded over $10 billion of NYSE and Nasdaq stocks for clients ranging from a large investment bank to small brokerage firms.

The United States is the only industrial nation whose stock markets still price stocks in weird fractions -- quarters and eighths to the public, sixteenths, thirty-seconds and sixty-fourths to professional traders. Contrary to what you may hear from some quarters, this is not because the nation that put the first man on the moon is technologically backward, nor because the stock markets cannot reprogram their computers to display decimals. Rather, it is because the people whom the Congress during the '30s put in charge of running the stock markets – dealers and specialists, through their trade associations – make billions of dollars in extra revenue that way.

Large-fraction pricing enables dealers to make greater profits from "making markets" than they would if individuals' freedom to price their orders were not constrained. This represents a huge government-enforced hidden subsidy from ordinary investors to securities dealers, mostly large and well-capitalized. As an economist, I am uncomfortable with any hidden subsidy to one segment of an industry. If there is a clear need to aid firms like Morgan Stanley, Goldman Sachs, and Bear-Stearns, you should enact legislation to do so directly. The hidden subsidy is in fact far more expensive because it hampers competition.

Securities dealers perform an important economic function. They deserve to be paid well for their intelligence and willingness to take risks, and they will continue to be. Decimal pricing will not reduce the bid-ask spread to one penny and it will not eliminate dealers. What it will do is:

- Free traders of an artificial constraint on their ability to compete imposed by quasi-governmental monopolies (SROs) which are a remnant of '30s-era legislation.
- Severely reduce the profitability of purchase/internalization of order flow arrangements, which are the main factor retarding quote price competition among market makers and discouraging limit order traders.
- Increase the attractiveness of a limit order trading strategy to those investors able to monitor their trading actively and willing to bear the risk.
- By increasing the flow of limit orders eventually bring an alternative source of liquidity to the market.
- Narrow the bid-ask spread to its true economic level, saving ordinary investors billions of dollars a year.

While I support the bill as drafted, I urge the Subcommittee to make it clear that the legislative intent of H.R. 1053 is that "quotation in dollars and cents" shall be taken to mean that the National Best Bid and Offer ("NBBO") – the standard "safe harbor" for "best execution" of purchased order flow – shall be not be rounded to any unit greater than one cent. It is an absurdity that today the so called NBBO can be up to 10.9 cents worse than the true national best. This costs retail investors heavily.

The Nasdaq stock market has already experienced a significant reduction in spreads as a result of the SEC's Order Handling Rules, despite lax enforcement and flawed implementation. I urge the Subcommittee to encourage the SEC not to relieve market makers of their obligation to make firm and meaningful quotes unless and until decimal pricing has been implemented. So long as dealers are receiving a multi-billion dollar subsidy, the least they can do in return is to honor one thousand share quotes. It would harm price discovery and risk the market's liquidity to let dealers off the hook before all of the prerequisites of an order-driven market are in place.

My testimony focuses on the intricate and critical linkage between market making, limit order trading, the purchase of order flow and the bid-ask spread.

TESTIMONY

I. MARKET ORDERS, LIMIT ORDERS AND DEALER QUOTES

The simplest kind of trading order is the market order: "Buy 200 shares of IBM (at market)", "Sell 100 shares of MSFT (at market)." When many investors call their broker to place an order, they may not even realize that there is any other way to trade. However, for there to be a market in which you can buy 200 shares of IBM quickly and at a reasonable price, your broker has to be able to find the other side; and this is where limit orders and/or dealer quotes come in. Limit orders (e.g., "sell 500 IBM at 107 ¾"), can provide the other side, i.e., "make the market", if they are displayed and can be "hit" efficiently. So also can dealer (or specialist) quotes if they are "firm".[1] The main difference between the two is that an individual limit order trader only makes the market temporarily, while a dealer is expected to make a continuous two-sided market[2].

Limit orders offer both advantages and risks to the investor seeking to buy IBM[3]. The advantage is that you may be able to buy it at a lower price. [For example, if the best inside prices (highest bid and lowest ask) are 107 ½ - 107 ¾, and your buy limit order for 200 at 107 ½ trades, you have saved $50 versus using a market order that trades at the ask.] However, you have two risks: (1) missing the boat, and (2) "adverse selection". These risks are critically important to the analysis in II below of structural flaws in the market. You will miss the boat if your buy order at 107 ½ doesn't get hit and if IBM subsequently starts moving up; this risk is increased if your order is not displayed effectively or if most of the sell market order flow bypasses your limit order. On the other hand, you may suffer from what microstructure academics call "adverse selection" if your order is hit. For example, suppose your 200 share order to buy IBM at 107 ½ is the last one in the NYSE's limit order "book" at that price and is hit by the first wave of an institution's 100,000 share sell order. You should not be surprised if, 5 minutes later, IBM is quoted 107 1/8 - 107 3/8. What makes the issue one of adverse selection is that your limit order is more likely to be filled if the market is about to move against you than if it is about to move favorably.

Adverse selection may be a theoretical concept, but it has a very real cost. For example, in the limit order trading system my firm constructed for its clients to use in trading stocks on the NYSE's SuperDOT system, we explicitly measured adverse selection cost and found that it has taken away a substantial proportion of the profit one would expect to earn by buying at the bid and selling at the ask. What is more, we have found that the adverse selection cost has risen over the years. I believe the reason is that the proportion of retail market orders coming to the NYSE has fallen. A retail market order contains little

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[1] Dealers, like any merchant advertising a specific quantity of product at a stated price, are required by law to honor their quotes so long as they are posted and the volume traded has not exceeded the quantity advertised. However, the SEC recently found that this "Firm Quote Rule" was frequently violated by dealers and rarely enforced by the NASD. See SEC, **Report Pursuant to Section 21a of the Securities Exchange Act of 1934 Regarding the NASD, The Nasdaq Market, and Nasdaq Market Makers**, August 8, 1996 (hereinafter "Section 21a Report"), pp. 32-33 and 42-44.

[2] For example, under NASD rules a dealer can be suspended from advertising (quoting) in the Nasdaq system for 20 days if he posts no quote for more than 5 minutes. This does not mean, however, that dealers must quote good prices (close to the "inside"), although until recently the NASD granted short sale rule exemptions only to dealers who quoted at or close to the inside most of the time.

[3] To my knowledge, the first paper to model rigorously the advantages and risks of limit order trading and to relate this to the determinants of the equilibrium bid-ask spread in a pure order-driven market was Cohen, Maier, Schwartz & Whitcomb (1981), "Transaction cost, order placement strategy, and the existence of the bid-ask spread," **Journal of Political Economy**, 89, 287-305.

adverse selection bias since, unlike an institutional order it is likely to be both small and uncorrelated with the next order to come[4].

Dealer quotes are functionally similar to limit orders in many ways and share their advantages and risks. Specifically, adverse selection costs dealers part of the profit they would otherwise make on the bid-ask spread. However, dealers have evolved means of partially protecting themselves against adverse selection not available to limit order traders; and their trade associations, the National Association of Securities Dealers and the stock exchanges (collectively the "SROs"), have enacted rules which have the effect of retaining these protections in the face of technological and market structure change.

There is no such thing as a pure order-driven market (i.e., a market with no dealers) or a pure dealer market (i.e., a market with no limit orders). The reason is that, despite their similarities, dealers and limit orders have distinct and complementary economic functions. For example, even in the markets for listed stock, dealers (block positioners) play a major role in effecting large institutional trades.

Until January 20, 1997, the Nasdaq market could be said to be largely a dealer market at the retail level. That is, you could give your broker a limit order, but there was no rule saying it had to be displayed and accessible to others, no mechanism for making it visible and accessible if the broker wanted to, and every incentive for the broker not to do so even if he could[5]. As a result, most retail customers for Nasdaq stocks had little alternative to having their orders filled by a dealer. Despite the significant role played by limit orders on the NYSE and AMEX, some of these same points could be made about the markets for listed stocks. Retail limit orders sent by a broker to third market dealers were generally not displayed, and the Regional Stock Exchanges seem generally to have made it clear that limit orders are unwelcome competition to their dealers.[6] Whether this situation has changed materially since January 20, 1997, when the SEC's Order Display and Handling Rules began to be implemented, is a subject of pure speculation, since the NASD (which is the SRO for both Nasdaq and third market dealers) has not announced any mechanism for monitoring and enforcing compliance with the Display Rules.[7]

II. THE FUNDAMENTAL STRUCTURAL FLAW IN THE MARKET SYSTEM

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[4] When institutions or block positioners have a large position to trade, they often break it up into smaller orders which are fed to the market at a pace calibrated to minimize price impact.

[5] The main exception has been the firms that offer high-turnover "day trading" services to their customers. These firms generally enable their customers to post limit orders on some or all of the "ECNs": SelectNet, Island and Instinet. Prior to January 20, these orders could only be seen and accessed by professional traders, some institutions, and other day traders, but this was enough to give these customers the execution capability they needed.

[6] For example, The Pacific Stock exchange has a system called SCOREX for executing retail orders sent by computer. Pacific's Rule 5.25 (b) (3) states "Specialists *must* accept all round-lot market orders…" while Rule 5.25 (c) B (4) states that "Round-lot limit orders *which are accepted* by a specialist…" [my emphasis]. The Philadelphia Stock Exchange has a similar system, PACE. Rule 229.18 states, in part, "Any established pattern of trading via PACE generating short-term trading profits by unjustly exploiting PACE volume execution guarantees is prohibited. Specifically, it is deemed an unjust use of PACE to place an order to buy at the primary market's bid price and simultaneously or shortly thereafter place an order to sell …at the primary market's offer price…." Admittedly, both SCOREX and PACE offer pretty good "volume execution guarantees" for limit orders, but (catch 22) don't try placing your limit order there. The alternative to using these electronic order systems is hand delivery of orders to the exchange floor, which is completely inefficient for most retail limit orders.

[7] Monitoring compliance is made difficult by the fact that the electronic ACT report which dealers must file within 90 seconds of completing a trade against a retail order contains no field for identifying whether the order was limit or market. Without feasible automated monitoring, labor intensive visual comparison of voluminous "hard copy" records is the only alternative. Even that seems not to have begun.

The purchase or internalization of order flow is a fundamental structural flaw in the markets for both NASDAQ and listed stocks that keeps spreads wider than they would be under true price competition, makes such practices as trading ahead and trading through hard to prevent, and disadvantages small market makers and limit order traders. It is common practice for many brokerage firms to have standing arrangements with market makers to sell all their orders of certain types (generally "low impact" retail orders which every market maker loves to fill) to those market makers. When orders of these types come in, they are "preferenced" to the market maker who has agreed to pay for them and to fill them at the "best inside price", the so-called National Best Bid and Offer (NBBO).[8] Essentially identical in its purpose and economic effect is the practice of "internalization" wherein a brokerage firm preferences its retail orders to a market making subsidiary. Purchase/internalization of order flow takes away much of the incentive for market makers to try to quote inside the prevailing NBBO prices.[9] It's like giving a party but nobody comes: you quote a better price than other market makers, but you don't get many orders; all you accomplish is to make other market makers pay more for their preferenced orders. Worse, the orders you do get are likely to be institutional, block positioner, or day trader orders, all of which are more likely to have adverse market impact (you buy in a falling market or sell in a rising market).

Purchase/internalization of order flow creates a non-level playing field because it represents a very substantial barrier to entry into market making and absolutely prevents limit order traders from having a level playing field with market makers. The most popular software enabling market makers to link to retail brokers and receive their order flow bears a high-six-figure annual license fee and it requires expensive fault-tolerant mainframe computers. More importantly, a market maker who wants to purchase order flow has to make a number of bilateral contracts with the retail brokers who have order flow to sell[10]. These barriers to entry effectively prevent small market makers from competing and obviously freeze out limit order traders.

Should payment for order flow be banned? The SEC has not moved to do so. There may be two reasons: (1) Payment for order flow is viewed by some as just another form of price competition[11]. I think this is a mistaken view because of the barriers to entry, but the public debate has not focused on this point. (2) The SEC, after lengthy attempts to promulgate a rule to require disclosure of payments for order flow, concluded that purchasing and internalizing order flow can take so many forms that it cannot effectively be defined. If you cannot define it, you cannot ban it. As a free-market economist, I think there is another way.

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[8] SEC and SRO "best execution" rules require dealers to fill customer orders at prices no worse than the NBBO. However, the presence of an "inside market" on Instinet and SelectNet prior to January 20, 1997 meant that the NBBO was not really the best, as prices 1/8 or even ¼ better were available to brokers and dealers, but not generally to their customers. See the Section 21a Report, pp. 21-22 and 25. Even today, the fact that prices posted on the ECNs are rounded to the worst eighth before being included in the NBBO, means that the true national best may be up to 10.9 cents better than the NBBO. [A selling price of 24 1/64 on Instinet is rounded to 24 1/8 before being included in the NBBO.]

[9] See Section 21a Report, p16. The SEC also noted, *loc. cit*., that purchase/internalization of order flow provides a means of establishing and enforcing the "pricing convention" which was at the heart of the Nasdaq scandal,

[10] The inefficiency of making bilateral purchase of order flow contracts with many brokers is probably the greatest barrier to entry facing small dealers. Note also that small retail brokers are less likely to be able to negotiate attractive rates for the sale of their order flow because of the same kind of diseconomy of small scale; many end up "giving" their order flow to a clearing broker who internalizes it.

[11] Clearly, in a competitive brokerage market and with even oligopolistic rivalry among dealers who purchase/internalize retail order flow, some of the dealers' increased profits from reducing their adverse selection costs will be passed on to retail brokers through higher prices for purchase of order flow and thence to customers through lower commission rates. But the costs will be passed on too, and the inefficient result is less trading volume.

III. THE IMPACT OF DECIMALIZATION

The free-market solution to the inefficiencies caused by payment for order flow and internalization is to permit market makers and limit order traders to quote their prices in dollars and cents. The reason is that decimalization will make the market for acquiring retail order flow more nearly competitive. Currently, if a dealer who does not have a source of preferenced order flow or a limit order trader wants to compete for retail order flow, he/she has to bid 12.5 cents/share higher or offer 12.5 cents/share lower. This is too high a price to pay for retail orders[12] when the going rate is only about 1 cent - 4 cents/share. Even sixteenth pricing[13] leaves limit order traders and small market makers hampered in their attempts to use price competition to capture retail order flow. It seems inherently unfair that, even if you have "made the market" by being the first to raise your bid or lower your offer, the nice, clean retail orders you would like to fill just bypass you.[14]

I believe that when market makers and limit order traders have the economic freedom to quote their prices in dollars and cents they will be able to compete quite effectively with dealers who purchase or internalize order flow. Clearly the dealers believe this, as evidenced by their opposition. For example, E.E. "Buzzy" Geduld, President of Herzog, Heine & Geduld, is quoted in one place as likening decimal pricing to Communism[15] and in an other as asserting that it may "cause the marketplace to dry up".[16]

Will decimalization cause the bid-ask spread to fall to one penny? Definitely not. My 1981 paper with Cohen, Maier and Schwartz[17] proved that even in a stylized marketplace where the minimum price increment is infinitesimal and there is no ability to segment order flow by type (e.g., by preferencing retail order flow to certain dealers), the spread has a finite "natural equilibrium" level so long as transaction costs are not zero. In the "real world", where dealers can still reduce their adverse selection costs relative to limit order traders by segmenting order flow and where it is costly and time consuming to monitor and re-price one's limit orders, spreads are completely unlikely to fall to the minimum pricing increment. However, spreads will fall. My academic colleagues will present evidence from the Canadian markets, but the clearest evidence from U.S. markets comes from the dramatic reduction in spreads in the Nasdaq market as the SEC's Order Handling Rules began to be implemented. When limit orders which were once hidden were included in the NBBO (even with rounding to the "worst eighth"), quoted spreads fell over 30%

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[12] Note that, even when you pay that price, you cannot be sure that the order coming to you is a retail order. The order flow into the general market is a mixture of retail and other. The best a limit order trader or a dealer who does not have preferenced order flow can hope for is that the order mix be as rich in retail orders as possible. Whatever reduces the incentives to divert retail order flow from the general market makes that mix richer.

[13] The American Stock Exchange and the Board of the Nasdaq Stock Market have, in the past month, approved proposals to permit traders to price stocks priced over $10 in sixteenth increments. Sixteenth pricing is clearly a step in the right direction, and it will narrow spreads and reduce the profitability of payment for order flow (hopefully, in some cases, below the cost of negotiating the bilateral contracts needed to implement it); but it still leaves the minimum increment 2 - 3 times the average price of a purchased order.

[14] All U.S. stock exchanges have rules giving limit orders precedence over specialists and most crossed orders. However, the fragmented nature of the market system means that a retail order sent to another exchange or to a third market dealer can trade ahead of your order. In addition, as noted in footnote 6 *supra*, many of the Regional Exchanges have rules and systems which discourage order flow competition from limit orders.

[15] **Wall Street Journal**, November 21, 1996, p. C 21.

[16] **Business Week**, March 31, 1997, p. 90.

[17] See footnote 6, *supra*.

literally overnight[18]. When we remove the biggest remaining impediment to competition from limit orders and among market makers, spreads will fall even more in both the Nasdaq market and the markets for listed stocks.

Will market "depth" fall along with spreads? Depth is a slippery concept; the answer depends on how you ask the question (how you measure depth). Yes, when you go from 12.5 cent price intervals to penny intervals, the number of shares bid or offered at the inside will diminish. That is a natural consequence of the fact that the number of price "slots" over any given range has increased. However, when you measure depth properly, as the ability of the market to withstand a given pressure on price, depth is unlikely to decrease. As individuals gradually gain the ability to use limit orders to get better prices, they will add a new source of liquidity to the market[19].

Will dealers disappear? Certainly not. Even with decimal pricing, dealers will retain a unique ability to reduce their adverse selection cost by purchasing order flow and matching "best inside" prices[20]. More importantly, the unique economic functions performed by institutional dealers and block positioners will not disappear when decimal pricing comes. As SEC Chairman Arthur Levitt pointed out when announcing the censure of the NASD and imminent implementation of the Order Handling Rules, "It's inevitable that some will complain that we're hurting the market by reducing [market maker] profitability. That's the perennial refrain, uttered at every turning point in the industry, from registering stock in the 1930s to unfixing commissions in the 1970s. It's a phony argument."[21]

Although dealers will not disappear, decimalization will remove a completely unwarranted subsidy to dealers from all other traders. It is impossible to estimate the size of the subsidy accurately, but in a market where 1 billion shares change hands daily, each penny reduction in the average spread reduces the annual gross subsidy by $2.5 billion. The net subsidy is less, of course, but the real cost is the inefficiency of a market structured to avoid competition[22]. As with deregulation of telephone rates, removing the

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[18] See "Spread Related Averages for First 50 Nasdaq Issues Phased in Under the SEC Order Handling Rules", an on-going study by the NASD Economic Research Department available at http://www.nasd.com. I cited the results posted January 21, 1997.

[19] The key word is "gradually". After years of "learning" that limit orders are hard and risky to trade in a market where the best incoming market orders are siphoned off, investors cannot be expected to retool overnight. After a long survey of inconclusive short-term impacts on volatility or depth measures from reducing tick size, Harris (1997) compares 1992 (immediate) with 1997 order pricing behavior of AMEX stocks and finds substantial evolution. See Lawrence Harris, "Decimalization: A Review of the Arguments and Evidence", University of Southern California working paper, April 1997, p. 14.

[20] Suppose the typical spread for a medium volume stock is 9 cents. Some dealers may still find it advantageous to pay 1.4 cents/share (say) for retail orders of 2000 shares or less and to match most inside prices in order to filter out the incoming orders likely to contain the most adverse selection bias. We should not expect the purchase (or especially the internalization) of order flow to disappear completely, only to diminish in both quantity and price. This is one of the points in Harris (1997 – see footnote 19, *supra*) , but his conclusion that decimalization is "unlikely to have much effect" is doubtful. Dealers do not agree with him; else why would they so strongly oppose decimalization? Note also that Harris' conclusion is at odds with his statement (p. 5) that regional stock exchange dealers will pay less for order flow "and may even be forced out of business." You can't have it both ways.

[21] *Statement by Chairman Arthur Levitt, U.S. Securities and Exchange Commission, Press Conference Regarding the NASD*, Washington DC, August 8, 1996, p. 2.

[22] The net subsidy is less because a portion of the subsidy is rebated to investors in the form of lowered commissions induced by competition among brokers receiving payment for order flow. There is slippage in this rebate, however, caused by the real costs of making and enforcing a multitude of bilateral contracts between brokers and dealers, shipping orders hither and yon to avoid competition from limit orders, and simply moving the money around. Harris (1997 – see footnote 19, *supra*) asserts in his Executive Summary that the estimates of savings in NYSE stocks are overstated because most trading is between public traders. This ignores the critical role of the regional exchanges, which are essentially dealer markets for NYSE-listed stocks. These markets siphon

subsidy to dealers by eliminating a major impediment to price competition is likely to bring major savings to customers (investors) and eventually a higher activity level. Even if some firms stop making markets, recall that most market making units are part of a trading firm; the infrastructure and skills needed to make markets can easily be shifted to other trading activities. Don't worry that "Buzzy" Geduld will go on welfare; let's focus on taking him off welfare.

Perhaps the most interesting argument against decimalization is the assertion that a large tick size is needed to protect public limit order traders from dealers and professional traders [sort of an "it's for their own good" argument].[23] Considering that it is dealers and the SROs which are dominated by dealers who most strongly oppose decimalization, one must suspect that something is missing in this argument. What is missing is the fact that dealers and other "professional" traders (that is, traders who have the time and resources to watch the market while they are trading[24]) do not have coincident interests. In the current market system with purchase/internalization of order flow and large tick sizes, professional traders and public limit order traders alike cannot compete with dealers. Large tick sizes are designed to preserve dealers' competitive edge over all other traders. It is probably true that the casual limit order trader will not be able to compete very well with limit order traders who are willing to watch the market (or to use software that does so for them), but the casual limit order trader is at a tremendous disadvantage currently. Decimalization will significantly lower the bid-ask spread which will benefit both market order traders and casual limit order traders who switch to market orders.

IV. IMPLEMENTATION OF DECIMALIZATION

You will hear from some quarters that it will take years and thousands of man-years of programming effort to convert all the computers in the stock exchanges, Nasdaq, the ECNs, the brokerage firms, the data vendors and the nation's newspapers to decimals. Be skeptical. I do not claim to be an expert on programming all these computers, but I do know a little something about the effort it took to program one firm's computers not to think in decimals. Recall that every computer comes with operating systems that display numbers in decimals; when you use a computer to display stock market data or enter trading orders, you have to write code to convert decimal numbers to fractions. One consequence is that the screen displays traders use are crowded, hard-to-read, and often cause traders to make mistakes. When you come to consider the one-time cost to convert to decimals, balance that against the continuing cost of teaching computers and people to do what does not come natural. In my opinion, the deadline set in H.R. 1053 – one year from passage – is realistic. To let the transition take any longer is merely to delay the benefits and prolong the subsidy.

During the transition period, and probably for a considerable period after implementation of decimal pricing, we should not expect the market to suddenly become order-driven. There have been so many impediments to limit order trading for so many years (they have, in some ways, even grown in recent years), and retail investors are so unfamiliar with the effective use of limit orders, that we cannot expect an

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off much of the retail order flow, a fact which Harris implicitly acknowledges when he notes elsewhere (p. 5) that regional dealers, "unconstrained by their limit order books", will "pay less for order flow". Specialists may play a small role in the NYSE *per se*, but dealers play a huge role in the markets for NYSE stocks.

[23] The most complete and scholarly exposition of this argument is to be found in Harris (1997), pp. 4-5; see footnote 19 *supra*.

[24] One other fact that Professor Harris misses in this argument is that a very large number of ordinary individuals are willing to take the trouble to monitor the market while they are trading, even if they do not watch it the rest of the time. The tremendous growth of Internet trading and PC trading (where ordinary individuals can "tune in" to a full real-time display of market data) is evidence that, even in the current market where the SROs benevolently protect public investors from decimalization, many public investors need to and do watch the market while they are trading.

overnight flood of limit orders when decimalization occurs. Despite the somewhat fairer treatment the SEC's Order Handling Rules appear to offer limit orders, there is no evidence that there has been a material increase in limit orders since the implementation of the Rules[25]. The significant reduction in quoted spreads that accompanied implementation of the Rules appears to have come from including in the NBBO limit orders that already were being posted on ECNs.

Until the impediments to limit order trading are removed, the SEC should not relieve Nasdaq market makers of their obligation to make firm and meaningful quotes[26]. This risks removing a major source of liquidity before a substitute is in place. Put differently, so long as dealers are receiving a multi-billion dollar subsidy from all other traders (not to mention free advertising on Nasdaq, blanket exemption from the short sale limitations, and favorable margin treatment), the least they can do in return is to honor one thousand share quotes. This imposes a small, affordable cost on them, reduces the incentives driving retail brokers into sale of order flow arrangements, gives the market a modest automated execution capability, and may add some liquidity in times of market stress.

[25] I mean exactly that: "there is no evidence". The NASD does not collect, and therefore cannot disseminate market wide data on limit orders.

[26] Currently, Nasdaq dealers are allowed to quote 50 important Nasdaq stocks (including the 10 largest) in units as small as 100 shares during a 3-month "pilot period" ending April 20. In several subtle ways, however, this experiment is biased toward showing more dealer liquidity than it is reasonable to expect if the 100 share quote minimum were made permanent and universal. See letter from former SEC Commissioner Richard Roberts to Richard Lindsey, Director, Division of Market Regulation, SEC, March 5, 1997.

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I received my Bachelor's degree in economics from Babson College in 1963 and my Ph.D., also in economics (With Distinction, Friedman Prize), from Columbia University in 1968. I am currently **Professor of Finance at the Graduate School of Management, Rutgers University.** I was Visiting Professor of Finance at the Australian Graduate School of Management in 1983 and Visiting Scholar at the University of Aix-Marseille in 1981. Before joining the faculty at Rutgers in 1975, I held positions at City University of New York, New York University and the RAND Corporation.

I was one of the earliest academic researchers in the microstructure of securities markets, a relatively new field in financial economics that studies the operations of securities markets. My articles have appeared in ***The American Economic Review, The International Journal of Finance, The Journal of Banking and Finance, The Journal of Finance, The Journal of Financial Economics, The Journal of Financial & Quantitative Analysis, The Journal of Industrial Economics, The Journal of Money, Credit & Banking, The Journal of Political Economy, Management Science, and The Review of Economics and Statistics***. I am author of one book, **EXTERNALITIES AND WELFARE** (Columbia University Press, 1972), and co-author of two others, **THE MICROSTRUCTURE OF SECURITIES MARKETS** (Prentice-Hall, February 1986), and **TRANSACTION COSTS AND INSTITUTIONAL INVESTOR TRADING STRATEGY** (***Salomon Brothers Center for the Study of Financial Institutions Monograph Series,*** 1988).

Besides my principal research interest in market microstructure, my other research interests include credit market theory, industrial organization, and economic theory. I have had consulting assignments in the area of market microstructure with the American Stock Exchange (*pro bono*), Citibank, Data Resources Inc., Instinet, the New York Stock Exchange, and Nihon Keizai Shimbun-America, and have received research grants in the field from Instinet, the Nomura Research Institute, and the New York Stock Exchange. My comments regarding NASD governance, various versions of the NAQCESS proposal, and other NASDAQ issues have been reported by CNN, NPR, PBS, AP, Business Week, The New York Times, Securities Week, The Wall Street Journal, The Washington Post, and other publications and cited in SEC Decisions.

I am also founder and President/CEO of Automated Trading Desk, Inc., which developed the first expert system for automated limit order trading of common stocks.

DISCLOSURE: Neither I nor any entity which I represent have received any federal grant, subgrant, contract or subcontract during the current fiscal year or either of the two preceding fiscal years, excepting federal grants to scholars or entities at Rutgers University other than myself or my department.